#1565

U.S. DEPARTMENT OF ENERGY
OAK RIDGE OPERATIONS
OAK RIDGE ORNL SITE OFFICE

TRANSMITTAL OF INFORMATION

The enclosed is to fulfill a request made by Chem Risk, as part of the *Oak Ridge Health Studies agreement* efforts. These documents have received the necessary reviews and may be released to the Chem Risk.

TIO Release Approval: David R Hamrick / M.E. Ketchel

Information enclosed: Reassessment of Oak Ridge Sewage Sludge Land-Farming Experience, Chemical Checklist for Distribution to selected HBCUS.

Requested by: Jennifer Lamb

Requested from: Joe Weaver

Approved: Timothy W. Joseph
Program Manager
DOE ORNL Site Office

Date: June 2, 1995

cc w/o enc: J. L. Weaver, 130 Mitchell, MS-6282

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

J. Lamb / K-25 CEP

Requestor — Document Center (is requested to provide the following document)

Date of request 4/13/95 Expected receipt of document 4/28/95

Document number none Date of document 8/6/86

Title and author (if document is unnumbered)
Vulnerability, W.F. Furth

(This section to be completed by Document Center)

Date request received 4/13/95

Date submitted to ADC 4/13/95

Date submitted to HSA Coordinator 4/13/95 * Forwarded to ORNL for processing

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Date submitted to CICO

Date received from CICO

Date submitted to ChemRisk/Shonka and DOE

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

cc: Jennifer Lamb
L.H. Thornton
4/17/95

* Joe Weaver - Please process.
4/17/95

cy: mem
LWL

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MARTIN MARIETTA

Internal Correspondence

August 6, 1986

K. Jarmolow

Vulnerability

You should be aware of a situation, created by DOE at ORNL, which is now becoming a vulnerability. Before the beginning of 1984, DOE-ORO had formed an agreement with the City of Oak Ridge to accept their sewage sludge. This sludge was to be used in an experimental program to test its impact upon tree farming. The agreement was that the sludge disposal should continue on each area until the loading reached the State limits (which was estimated to be about six to eight months).

Just before April 1, 1984, it was discovered that this sludge was radioactive, a condition that had not been contemplated when DOE-ORO made its commitment to the city. After an investigation, it was concluded that the radionuclide levels did not exceed the DOE standards, based on 1984 data and criteria.

DOE had directed and managed these sludge disposals. They have continued through 1984, 1985 and—more than two and one half years later—are still continuing. The sludge is still being placed on the same area on the reservation, just north of Bethel Valley Road and just west of McCoy Branch and Rogers Quarry.

Late in 1984, Wayne Hibbitts and Joseph C. Lenhard of DOE-ORO asked the ORR-RMC (then attached to ORNL) whether the radionuclides in this sludge were compatible with the As Low As Reasonably Achievable (ALARA) principles of DOE. For unknown reasons this request languished until the beginning of 1986 when the ORR-RMC took up that question. Staff from Chet Richmond's organization provided the technical evaluations. It was concluded that the levels exceeded the current ALARA criteria (1 mrem/year), that the ground was also contaminated with nitrates beyond allowable limits, and that the material should not be acceptable for land farming. These conclusions were transmitted in a very polite letter to Dick Egli of DOE-ORO (enclosed) who at that time was the designated recipient of such communications from ORR-RMC. Management at the three Energy Systems installations and the COTR's at DOE-ORO were also informed.

Since then, the following seems to have happened:

- DOE was informed, in late 1985, by ORAU that the radionuclide sludge content had increased considerably (factor of ~ 10). DOE did not pass this information on to Energy Systems.
- A researcher from ORNL has complained in writing to the State that the runoff from the site is contaminating some of his experiments in Rogers Quarry.

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- The State has confirmed excess nitrogen in the soil and has threatened the city (and DOE) with actions. Four State agencies are getting themselves involved.

- DOE-ORO and the city have complained to the State that the State has granted permission to Quadrex (the primary source of radionuclides) to increase their radionuclide discharges to the sewer without the State informing either the city or DOE-ORO.

- Dust frequently flies from the area. We have been informed by regulators that the odor indicates saturation of the soil. No "tests" or "experiments" have been concluded to date.

- A concern that the discharge from this sludge field may be contaminating the swimming and drinking water sources of Clark Center Park has been raised. Data to date indicate that two of the four samples exceed the State regulations as follows: "The fecal coliform content of waters of swimming areas in or used shall not exceed a geometric (log) average of 200 fecal coliforms per 100 ml for any five (5) consecutive samples collected on separate days, nor shall more than two (2) of any five (5) consecutive samples collected on separate days exceed 1,000 fecal coliforms." The State Food and Environmental Sanitation Department has advised that the water in Clark Center Park should be tested for hepatitis or other human pathogenic (State limits nondetectable). We are in the process of testing the water based on guidelines from the State staff.

  Previous to the current sampling, fecal coliform was essentially not detectable in these waters.

- Apparently to avoid the results of their own actions, DOE is attempting to designate this activity as a "demonstration project."

  I am not certain what it should demonstrate. If it is supposed to be an elegant demonstration of the dangers of self-regulation or results of mismanagement, it certainly would be excellent but superfluous (other exhibits abound). If it is supposed to demonstrate how the City, TDHE, EPA, and ORO can fail to communicate, I must question the need.

Other than possibly showing recovery from a self-generated evil, this project does not demonstrate anything that is not already known.

In summary, DOE (in conjunction with elements of ORNL) has—

- Violated DOE ALARA principles

- Created an eyesore and created confusion and concern among the State regulators
- Exceeded the nitrate limits on several acres
- Possibly contaminating the public use waters at Clark Center Park

This, in my view, is a vulnerability.

W. F. Furth, 1000, 214-A, ORNL (6-8006) - NoRC

WFF:cj
Enclosure

MARTIN MARIETTA ENERGY SYSTEMS, INC.

POST OFFICE BOX X
OAK RIDGE, TENNESSEE 37831

April 2, 1986

Mr. Richard L. Egli, Assistant Manager
for Safety and Environment
Department of Energy, Oak Ridge Operations
Post Office Box E
Oak Ridge, Tennessee 37831

Dear Mr. Egli:

Reassessment of Oak Ridge Sewage Sludge Land-Farming Experience

This letter completes the last of the action items for the Oak Ridge Reservation Resource Management Committee (ORR-RMC) resulting from the February 7, 1986 meeting with the Oak Ridge Operations Land Use Committee. References related to the subject are listed in Attachment 1. Information contained in references 1 and 2 completed the other two action items. From September 1984 to the present, members of the ORR-RMC have reassessed the Oak Ridge city sewage sludge land-farming experience. Background information on land-farming of Oak Ridge sludge used in this reassessment is summarized in Attachment 2.

The ORR-RMC recommends the following:

1. The holding pond materials should not be accepted for land-farming on DOE lands.

2. The current site being used for land-farming should be closed no later than May 30, 1986.

3. A closure plan for the current site should be completed before May 30, 1986.

4. Land-farming of radioactively contaminated sludge with concentrations greater than 1.4 pCi/g ^{137}Cs, 0.7 pCi/g ^{90}Sr, 0.5 pCi/g $^{238,239,240}Pu$, 0.55 pCi/g dry weight ^{234}U, 0.21 pCi/g dry weight ^{235}U and 0.49 pCi/g dry weight ^{235}U should not be continued beyond May 30, 1986.

The basis of ORR-RMC recommendation 1 through 4 is given below.

Basis for Recommendation 1:

The radionuclide concentrations (Tables 1 and 2) in the holding pond material is too high for land-farming. This material should be placed in a state-approved landfill (city or DOE), or it would be acceptable in a semi-dry form for use as backfill for trenches in one of the DOE low-level waste shallow land burial sites.

Basis for Recommendation 2:

The city has informed us that the current site nitrogen load is at, or possibly exceeding, the State permit limit.

Basis for Recommendation 3:

As part of the State/EPA draft of the ORNL NPDES permit, a Best Management Practice Plan for control of runoff and groundwater contamination from the current land-farming site has been requested. A closure plan would meet this request.

Basis for Recommendation 4:

The basis of these criteria or guidelines assumes that this property will be available for unrestricted use in 50 years and that no member of the population should receive a radiation dose exceeding a de minimis dose of 1 millirem as recommended by the National Council on Radiation Protection and Measurements[15] and the International Commission on Radiological Protection.[16] This de minimis dose is intended for application to human-made radionuclides. The concentration guidelines were derived from a number of radiation protection limits by using source-to-dose conversion factors for an intruder-agriculture scenario. Surface soil guideline values from references 11 through 13 were used and are based on evaluation of pathways of inhalation, ingestion, and external radiation exposure to humans from a 100-m x 100-m area of contamination. These guidelines were based on a 500 millirem/year dose limit. Therefore, the recommended guidelines were divided by 500 in order to get to the de minimum dose. This resulted in 0.2 pCi/g dry wt for ^{137}Cs, 0.5 pCi/g dry wt for ^{90}Sr, 0.5 pCi/g dry wt for $^{238,239,240}Pu$, and 0.15 pCi/g dry weight for each ^{234}U, ^{235}U and ^{238}U. We then added soil concentration from the remote locations given in Reference 13, which were 1.2 pCi/g dry wt for ^{137}Cs, 0.20 pCi/g dry wt for ^{90}Sr, 0.011 pCi/g dry wt for ^{239}Pu, 0.002 pCi/g dry wt for ^{238}Pu, 0.4 pCi/g dry weight for ^{234}U, 0.06 pCi/g dry weight for ^{235}U and 0.34 pCi/g dry weight for ^{238}U. This addition of background concentration resulted in 1.4 pCi/g dry wt for ^{137}Cs, 0.7 pCi/g dry wt for ^{90}Sr, and 0.5 pCi/g dry wt for $^{238,239,240}Pu$, 0.55 pCi/g dry weight for ^{234}U, 0.21 pCi/g dry weight for ^{235}U and 0.49 pCi/g dry weight for ^{238}U. For the isotopes of uranium, direct ingestion of the material was assumed. Consistent with the normal practice, neither radioactive decay nor dilution by uncontaminated soil was considered in the development of these recommended guidelines.

If you have need for additional information, please contact T. W. Oakes, Chairperson of ORR-RMC, at 6-8499.

Sincerely,

Werner F. Furth, Director
Environment, Safety, and Health

WFF:TWOakes/jct

Attachments

cc/att: W. D. Adams, DOE-ORO
G. G. Fee
J. L. Foutch, DOE-ORO
W. R. Golliher
C. C. Hopkins
R. G. Jordan
J. R. Langley, DOE-ORO
J. A. Lenhard, DOE-ORO
W. F. Manning, DOE-ORO
T. W. Oakes - RC
H. Postma
K. W. Sommerfeld
R. S. Wiltshire
File-WFF-NoRC

Table 1. City of Oak Ridge sludge drying beds (pCi/g)*

		^{60}Co	^{137}Cs	^{134}Cs	^{54}Mn
West plant	Bed # 1	123	29		3
	2	123	29		3
	3	120	31	3	3
	4	94	16		
	5	260	100	5	
	6	93	14		3
East plant	Bed # 1	170	62	5	4
	2	180	76	6	3
	4	180	67	5	
	6	230	80	7	
	7	184	72		
	8	182	74		

*Reference #10.

Table 2. City of Oak Ridge holding ponds*

Isotope	Curies (μCi)	Percent abundance of total
^{60}Co	7758	71.7
^{137}Cs	2056	19.0
^{134}Cs	314	2.9
^{54}Mn	422	3.9
^{235}U	76	0.7
^{40}K	216	2.0
^{124}Sb	32	0.3
^{110m}Ag	444	4.1

*Reference #9.

Table 3.

Pathway	Dose[a] contaminant (millirem/year)	
	Endosteal cells	Total body
Direct radiation	[b]	[b]
Direct inhalation	2.0E-03	5.5E-04
Water ingestion	2.8E-02	3.7E-03
Fish ingestion	4.14	1.1
Deer meat ingestion	8.7E-03	2.1 E-03
Total	4.2	1.1

[a] All dose commitments have background subtracted.
[b] Measured values indicate background levels on the old Bethel Valley Road.

Attachment 1

References:

(1) W. F. Furth to P. D. Dayton, "Review Meeting With the Oak Ridge Operations Land Use Committee," February 28, 1986.

(2) W. F. Furth to R. L. Egli, "Reservation Resource Management Committee Review of Proposed Transfer Parcel D - Additional Information and Comments," February 24, 1986.

(3) W. N. Haddock to H. Postma, "Proposed New Sewage Treatment Plant, " May 3, 1978.

(4) H. Postma to J. A. Lenhard, "Disposal of Sewage Sludge on Oak Ridge Reservation Lands," May 19, 1978.

(5) J. A. Lenhard (note) to Distribution, "Disposal of City Sludge," June 5, 1978.

(6) J. A. Lenhard to John Leonard, "Disposal of City of Oak Ridge Sewage Sludge on U.S. Department of Energy Owned Lands, Oak Ridge, Tennessee," October 18, 1983.

(7) Report on the Oak Ridge Sewage Sludge Land-Farming Experience: Part I - Data Presentation, August 1984, ORNL-6062/P1.

(8) Report on the Oak Ridge Sewage Sludge Land-Farming Experience: Part II - Pathways Analysis, August 1984, ORNL-6062/P2.

(9) J. T. McVey to M. Mobley, "Data on Holding Ponds," August 17, 1984.

(10) J. A. Lenhard to R. S. Wiltshire, "City of Oak Ridge Sewage Sludge," November 14, 1984.

(11) J. W. Healy, An Examination of the Pathways From Soil to Man for Plutonium, LA-6741-MS, 1977.

(12) J. W. Healy, J. C. Rodgers, and C. L. Wienke, Interim Soil Limits for D&D Projects, LA-UR-79-1865-REV, 197.

(13) DOE-ORO, "Radiological Guidelines for Application to DOE's Formerly Utilized Sites Remedial Action Program," ORO-831(REV), March 1983.

(14) Environmental Monitoring Report, United States Department of Energy, Oak Ridge Facilities, Calendar Year 1984, ORNL-6209, 143 pp., Martin Marietta Energy Systems, August 1985.

(15) National Council on Radiation Protection and Measurements, Recommendation on Radiation Exposure Limits, July 25, 1985.

(16) International Commission on Radiological Protection, "Recommendations of the International Commission on Radiological Protection," ICRP Publication 26, Ann. ICRP 1, No. 3, pp. 1-53, 1977.

Attachment 2

1. In 1978, negotiations were initiated between the City of Oak Ridge and the Department of Energy (DOE) Oak Ridge Operations office to consider the land disposal of treated sludge from a new city sewage treatment plant, which was scheduled for completion in 1983 (References 3-5).

2. The sludge was to be placed on several parcels totaling about 1,500 acres located within the DOE Oak Ridge Reservation for a trial period of five years.

3. The sludge was to be used as a nitrogen and phosphorus nutrient supplement for tree plating operations on poor quality forest sites within the Reservation.

4. In 1980 and 1981, DOE/ORO and the City of Oak Ridge verbally agreed to dispose of the sludge on the Reservation.

5. On October 18, 1983, DOE/ORO gave permission to State personnel to enter the Reservation to inspect potential disposal sites (Reference 6).

6. On November 28, 1983, the State issued permission to the City for the sludge disposal operation.

7. The initial sludge disposal site consisted of 65 acres located on the southeast side of Chestnut Ridge, bordered on the south by the old Bethel Valley Road and on the west by Mount Vernon Road.

8. Deposition on the above 65-acre site was begun in November 1983.

9. On March 22, 1984, it was learned that some of the deposited sludge had been contaminated with various radionuclides primarily Co-60 and Cs-137.

10. Disposal of sludge on the 65-acre site was temporarily halted on March 25, 1984.

11. A comprehensive sampling and monitoring study of the 65-acre site was instituted on March 30, 1984.

12. A data presentation of the results of the sampling and monitoring study was published in August 1984 (Reference 7).

13. A pathway analysis was performed (Reference 8) on direct radiation from the 1984 sludge contaminated field, inhalation of dust from the field, consumption of water by a swimmer swimming in Clark Center swimming area, consumption of fish caught from the McCoy embayment,

and consumption of deer that might graze on the disposal field. The summary of dose contributions by pathway to the maximally exposed number of the public is given in Table 3.

14. The holding ponds were found to be contaminated (References 9-10). See Tables 1 and 2.